

		RPP-27195
CH2M HILL Hanford Group, Inc.	Manual	ESHQ
ELECTRICAL SAFETY	Document	TFC-ESHQ-S-STD-03, REV B-10
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	Effective Date	July 9, 2008

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1.0 PURPOSE AND SCOPE

(5.1.1, 5.1.2, 5.1.3.a, 5.1.4, 5.1.5, 5.1.18, 5.1.19)

This standard establishes the CH2M HILL Hanford Group, Inc. (CH2M HILL) Electrical Safety Program (ESP). The electrical safety program provides the minimum requirements for safe electrical system design and installation, electrical safe work practices and defines electrical safety training for employees.

This standard applies to all CH2M HILL Hanford Group, Inc. (CH2M HILL) and subcontractor employees. This standard does not apply to equipment or installations that are under the exclusive control of Electrical Utilities (EU) for the purpose of metering, transmission and distribution of electrical energy.

2.0 IMPLEMENTATION

This standard is effective on the date shown in the header.

3.0 STANDARD

3.1 Roles and Responsibilities

3.1.1 Vice President, Safety, Health, and Quality Assurance

Responsible for appointing a representative from the following work groups to serve as the Authority Having Jurisdiction (AHJ) for electrical matters:

- Engineering
- Electrical Craft
- Industrial Safety.

3.1.2 Director, Safety Programs

- Appoints the Electrical Safety Program Coordinator (ESPC).

3.1.3 Electrical Safety Program Coordinator

- Serves as chairperson of the CH2M HILL Electrical Safety Committee (ESC).
- Serves as the Industrial Safety AHJ member.
- Promotes and coordinates electrical safety initiatives within the company.
- Coordinates electrical safety initiatives and activities with DOE and other Hanford contractors.

3.1.4 Vice Presidents of ~~Base~~ Operations, Retrieval ~~and~~ Closure Operations, and Analytical Technical Services

- Review and approve Energized Electrical Work Permits.

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3.1.5 Maintenance and Operations Managers

- Ensure work group participation on the CH2M HILL ESC.
- Ensure that safe work practices described in National Fire Protection Association (NFPA) 70E-2004 are used by workers under their direction, including non-electrical workers who use portable electrical tools and equipment.
- Ensure that employees performing electrical work or using portable electric tools and equipment are qualified to safely perform their assigned task.
- Ensure that approved personal protective equipment (PPE) for electrical work, is provided and used by those workers who are exposed to electrical hazards. Electrical PPE shall provide a level of protection commensurate to the level of hazard.
- Ensure that workers exposed to electrical hazards do not wear clothing and accessories (e.g., meltable-fiber clothing and metallic objects) that may worsen injuries in the event of an electrical accident.
- Ensures lead terminations are documented on the work document or Lifted/Landed Lead Record form (A-6003-876) prior to lifting and landing leads as required by the work document instructions or by direction of the Field Work Supervisor.

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3.1.6 Director, Engineering Standards

- Identifies a qualified electrical engineer to serve as the Engineering AHJ member.
- Ensures that electrical system designs are compliant with NFPA 70-2005, National Electrical Code (NEC).
- Ensures that electrical drawings, facility modifications packages, and other design documents are in compliance with CH2M HILL standards.
- Ensures that qualified engineering support is available to perform shock hazard analysis, flash hazard analysis, and other analysis that may be required to support electrical safety.

3.1.7 Electrical Safety Committee Members

- Openly promote the ESC and electrical safety issues throughout the company by communicating regularly with craft, supervisors, managers and safety personnel to identify electrical safety concerns and suggestions for electrical safety program improvements.
- Review electrical safety incidents, including lessons learned and occurrence reports, to identify trends and ensure that corrective actions have been effectively implemented.
- Identify the need for new electrical safety initiatives.
- Identify opportunities for improving electrical safety awareness training and participate in the development and communication of such initiatives.

- Participate in electrical safety event investigations by serving as subject matter expert to the event investigation team.
- Participate in electrical safety assessments and inspections, ad hoc subcommittees, and special teams as assigned.
- Actively participate in scheduled ESC meetings.

3.1.8 Authority Having Jurisdiction (AHJ)

(5.1.17)

- Enforces and interprets the National Electrical Code (NFPA 70-2005) (NEC); Standard for Electrical Safety in the Workplace (NFPA 70E-2004); 29 CFR 1910, Subpart S; and 29 CFR 1926, Subpart K.
- Unanimously agrees to all decisions and interpretations.
- The Engineering Standards AHJ representative prepares and issues the formal documented interpretations of the AHJ.
- Documents AHJ decisions and interpretations in the ESC meeting minutes and publishes decisions and interpretations on the CH2M HILL Hanford Electrical Safety web page.
- Represents the CH2M HILL at external electrical safety meetings as appropriate (the ESC chairperson may assign others to perform this function).
- The Engineering Standards AHJ representative provides oversight of the company's NEC Inspector(s).

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3.2 Electrical Safety Training

(5.1.2, 5.1.12, 5.1.13, 5.1.19)

1. All CH2M HILL and subcontractor employees shall attend electrical safety training, commensurate to their exposure to electrical hazards in accordance with 29 CFR 1910.332. The minimum electrical safety training shall include:
 - All employees take Hanford General Employee Training (HGET)
 - Workers who may be exposed to electrical hazards shall have electrical safety training, commensurate to their assigned duties, as identified and listed in their ITEM Training Profile
 - Refresher training, to update regulations and electrical safety criteria, should be provided at intervals not to exceed three years.
2. Electrical workers (qualified persons) shall attend First Aid training. This training shall be repeated at intervals not to exceed two years.

3. All employees that work on de-energized electrical components being controlled by a lockout/tagout must be trained as an authorized worker in accordance with [TFC-OPS-OPER-C-05](#).
4. First line managers, field work supervisors, and persons-in-charge (PICs) shall receive the same level of electrical safety training as the workers for whom they supervise if those workers have the potential to be exposed to electrical hazards.
5. A pre-job briefing shall be conducted in accordance with [TFC-OPS-MAINT-C-02](#) before starting work.

3.3 Electrical Equipment Approval Requirements

(5.1.2, 5.1.5, 5.1.6, 5.1.7, 5.1.8, 5.1.9, 5.1.12, 5.1.14)

1. All electrical equipment installed or used within CH2M HILL shall be approved by the AHJ per Article 110.2 of NFPA 70-2005, NEC.
2. Electrical equipment shall be free from recognized hazards that are likely to cause death or serious physical harm to employees and used and stored in accordance with 29 CFR 1910.302, 303, and 333.
3. Electrical equipment is approved, and therefore acceptable for use in accordance with the approval, under the following conditions:
 - The manufacture's name, trademark, or other descriptive makings identifying the organization responsible for the product is on the equipment and is legible

and
 - If it is accepted, or certified, or listed, or labeled, or otherwise determined to be safe by an OSHA recognized [nationally recognized testing laboratory \(NRTL\)](#), as indicated by an NRTL label applied by the manufacturer

or
 - If it has been labeled by an NRTL representative following an NRTL field evaluation

or
 - After non-listed equipment has been field tested and found to be acceptable in accordance with the guidelines established by the AHJ.

NOTE: Electrical equipment acquired prior to October 13, 2003 (legacy equipment) may remain in service, so long as it has not been modified, found to be defective, or damaged, and does not present a level of hazard to the workers.

NOTE: Nationally recognized testing laboratories are listed on the OSHA web site at <http://www.osha.gov/dts/otpc/nrtl/index.html>.

3.4 Installation/Modification Requirements

1. Wiring design and protection shall be developed and installed by qualified personnel and verified compliant with the NEC and applicable 29 CFR 1910.304 and 305 requirements.
2. NEC inspections are required for all new electrical installations and modifications to existing electrical installations covered by the most current edition of the NEC.
3. All electrical installations, systems, wiring, and connected utilization equipment shall, be maintained in a safe condition free from recognized hazards that are likely to harm employees. Unsafe electrical systems and equipment that present an imminent hazard to personnel shall be de-energized and removed from service until repaired or replaced, unless de-energizing would introduce additional or increased hazards.

NOTE: Refer to [TFC-PRJ-P-C-02](#) for specific details regarding how to request NEC inspections.

3.5 Electrical Safe Work Practices

(5.1.2, 5.1.10, 5.1.11, 5.1.12, 5.1.15, 5.1.16, 5.1.19)

This section applies to all electrical work > 50 volts that is capable of more than 1 milliamp (mA) of current. 1 mA is the approximate threshold of perception for 60 Hz AC current, and it is not an electrical shock or arc flash hazard.

NOTE: Personnel may perform electrical work only to the level for which they have been trained, qualified, and authorized to perform.

1. The requirements of the lockout/tagout program, as described in [TFC-OPS-OPER-C-05](#), must be used for the control of unexpected releases of hazardous energy or materials.
2. Electrical hazards shall be mitigated utilizing the controls provided in Attachment A.
3. In accordance with 29 CFR 1910.335, appropriate signs, tags, barricades, or attending personnel shall be used to warn and protect employees from hazards that could cause injury due to electric shock, burns, or failure of electric equipment parts.
4. Equipment, not cord and plug and circuits, capable of being energized, must be treated as live if they are not locked out and tagged out in accordance with [TFC-OPS-OPER-C-05](#). Equipment with a cord and plug can be considered de-energized when the plug is under the direct control of the qualified person performing the work.
5. When work is performed on or near equipment or circuits that are or may be energized, safety-related work practices must be employed to prevent electrical shock, flash burns, or other injuries resulting from either direct or indirect electrical contact. Specific safety-related work practices shall be consistent with those identified within NFPA 70E-2004 and 29 CFR 1910, Subpart S - Electrical for potential hazards associated with the type of work being performed.
6. Live parts to which an employee may be exposed shall be put into an electrically safe work condition before an employee works on or near them (within the limited approach boundary), unless work on energized components can be justified. (5.1.19)

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7. Managers shall ensure that all workers are provided with protective clothing and PPE that is appropriate for the potential shock or arc flash to which they may be exposed.
(5.1.4, 5.1.19)
8. Non-conducting and insulating equipment must be used and stored according to the manufacturer's instructions.
9. Electrical protective equipment shall be verified (before use) to have satisfied all required tests, e.g., rubber gloves have been air tested. Electrical protective equipment that has an expired testing date or fails visual or functional inspection must be removed from service.

NOTE: Electrical protective equipment repair must be performed by qualified personnel.
10. Only NRTL approved equipment shall be used for performing electrical testing. All electrical test equipment shall be designed, rated, and approved for their intended use. It shall be visually inspected for external damage before each use. Damaged or defective equipment shall be immediately removed from service.
11. Non-contact, or proximity voltage testers, shall not be used to verify an electrically safe work condition for purposes of hazardous energy control.
12. All portable electric equipment, including flexible extension cord sets, shall be approved and suitable for its intended use. It shall be visually inspected for external damage (such as loose parts, deformed and missing pins, or damage to outer jacket) and for evidence of internal damage (such as pinched or crushed outer jacket) before being used on any shift. Damaged or defective equipment shall be immediately removed from service and not be used. Flexible cords and cables will be protected from accidental damage. Sharp corners and projections shall be avoided.

NOTE: Cord and plug connected equipment and extension cord sets that remain connected once they are put in place and are not exposed to damage are not required to be visually inspected until they are relocated.
13. Special purpose equipment and installation (electric signs, electric welders, elevators, cranes, etc.) shall be evaluated on a case-by-case basis and safeguarded in accordance with 29 CFR 1910.306 and the appropriate sections of the NEC.
14. Electrical installations or equipment use in hazardous locations (containing flammable vapors, liquids, gases, etc.) shall be evaluated on a case-by-case basis and safeguarded in accordance with 29 CFR 1910.307 and the appropriate sections of the NEC.
15. Special systems (over 600 volts, emergency power, etc.) shall be evaluated on a case-by-case basis and safeguarded in accordance with 29 CFR 1910.308 and the appropriate sections of the NEC.
16. Extension cords shall not be connected in series (daisy-chained). Extension cords will be unplugged and stored when not in use.

17. Relocatable power taps and transient voltage surge suppressors shall be connected only to permanently installed branch circuit receptacles. They shall not be connected (daisy chained) to other power taps, surge suppressors, or to extension cords.

3.6 Ground Fault Circuit Interrupters

1. Ground Fault Circuit Interrupter protection (GFCI) for personnel protection shall be provided and used whenever portable electrical tools and equipment are used with temporary wiring methods or extension cord sets for construction, repair, maintenance, remodeling, and similar activities. This applies to portable tools and equipment connected to 125 volt, single phase, 15-, 20-, 30-amp receptacle outlets.
2. Portable electrical tools and equipment that is being used out of doors or in damp or wet locations shall always be provided with GFCI protection.
3. Ground fault circuit interrupters (GFCIs) shall be installed as required by the NEC, including:
 - On 125 volt outside receptacles
 - Within six feet of a sink or an outside door
 - In damp or wet (standing water) work areas
 - On all 125 volt receptacles that are not part of the permanent structure wiring (including extension cords) and that are in use by personnel.
4. Permanently installed GFCIs shall be tested monthly in accordance with the manufacturer's instructions.
5. Portable GFCIs shall be tested before each use. The test sequence is:
 - A visual inspection is performed to detect any obvious defects, broken or damaged parts. Any GFCI that is determined to be defective in any way shall be immediately removed from service.
 - The reset button is pressed and it is verified that voltage is provided at the outlet.
 - The test button is pressed and it is verified that there is no voltage at the outlet (this causes the GFCI to trip; a click can be heard or felt whenever the GFCI trips).
 - The reset button is pressed and it is verified that power has been restored at the outlet.
6. GFCIs that fail to respond as stated in this procedure shall not be used and management shall be informed of the failed test. A work request shall be initiated to have qualified electricians re-inspect, troubleshoot, and repair the GFCI so that it can be restored to service. Refer to 3-EDS-180, "Inspection and Test of Ground Fault Circuit Interrupter Receptacles and Circuit Breakers."

3.7 Receptacle Outlets

All 125 volt, single phase, 15-, 20-, 30-amp receptacle outlets that are not a part of the permanent wiring of the building or structure, and that are in use by personnel, shall have GFCI protection. If a receptacle is installed or exists as part of the permanent wiring of the building or structure and is used for temporary electrical power, GFCI interrupter protection for personnel shall be provided. Cord sets or devices incorporating GFCI protection for personnel identified for portable use shall be permitted.

When receptacle outlets will be used to supply temporary power to equipment provided for safety (e.g., lighting, monitoring functions) evaluate with the assistance of a knowledgeable person (electrical engineer/electrician) the existing connected loads with the additional loading to ensure it is within the capacity of the branch circuit. If necessary, restrict use of other receptacle outlets on the same branch circuit.

Avoid overloading branch electrical circuits. Electrical loads such as a portable 1000-1500 watt space heater will draw 9-13 amps and a coffee pot rated 900-1100 watts will draw 8-9 amps. Review the labeling on plug-in devices to identify specific power requirements. Typical branch circuits are only rated for 15 or 20 amps and supply multiple loads. See Section 3.11 for resetting tripped protective devices.

3.8 Assured Equipment Grounding

1. A documented assured grounding program shall be continuously maintained for all cord sets, receptacles not part of the permanent wiring of the building or structure, and equipment connected by cord and plug that is used for construction, maintenance, repair, remodeling and similar activities if a greater hazard would be created if power was interrupted or if the receptacle outlets or the tools and equipment are of a design that is not compatible with GFCI protection, such as 480 volt equipment.

2. The assured grounding program is implemented through the Preventive Maintenance Program.

3. All cord sets, receptacles not part of the permanent wiring, and equipment connected by cord and plug shall be maintained in accordance with NFPA 70E-2004, Section 410.4(B)(2).

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3.9 Working on or Near Live Parts

1. Electrical equipment shall be de-energized to the maximum extent feasible before crossing the limited, restricted, or prohibited approach boundary to perform work on the equipment.
2. Entry into an electrical approach boundary by a qualified worker requires an Energized Electrical Work Permit ([A-6003-873](#)), approved by the appropriate vice president.
 - Minimum clear distances shall be maintained from exposed electrical live parts in accordance with NFPA 70E-2004 NEC and 29 CFR 1910.303 and 333.

3. The only work that can be performed by qualified personnel on or near energized equipment, without an Energized Electrical Work Permit is the following:

NOTE: The following exceptions require identification of known and potential hazards (shock and arc flash), identification of all required PPE and insulated tools, and identification of protective measures and equipment to be used when performing the work.

- Working on energized parts that operate at LESS THAN 50 VOLTS potential
- Testing and calibration of electrical equipment that can only be performed with the circuit energized under an existing approved procedure
- Performing voltage and zero energy checks for lockout/tagout operations
- Performing troubleshooting that requires the equipment to be energized.
- Performing visual inspections
- Installation of temporary protective measures such as protective shields/barriers, rubber insulating equipment, voltage rated plastic guard equipment, and physical or mechanical barriers.

NOTE: Use of these temporary protective measures shall be documented in the work record.

3.10 Working Within the Limited Approach Boundary or Flash Protection Boundary

1. A shock hazard analysis shall be completed prior to work. The analysis shall determine the voltage to which personnel will be exposed, boundary requirements, and the personal protective equipment necessary in order to minimize the possibility of electric shock to personnel.
2. No qualified person shall approach or take any conductive object closer to exposed live parts operating at 50 volts or more than the Restricted Approach Boundary set forth in NFPA 70E-2004, Table 130.2(C), unless any of the following apply:
 - The qualified person is insulated or guarded from the live parts operating at 50 volts or more (insulating gloves or insulating gloves and sleeves are considered insulation only with regard to the energized parts upon which work is being performed), and no uninsulated part of the qualified person's body crosses the Prohibited Approach boundary set forth in NFPA 70E-2004, Table 130.2(C).
 - The live part operating at 50 volts or more is insulated from the qualified person and from any other conductive object at a different potential
 - The qualified person is insulated from any other conductive object as during live-line bare-hand work.
3. An arc flash hazard analysis shall be completed and documented, in the work package, to identify hazards and determine appropriate safe work practices, protective clothing,

and electrical PPE to be used before any person approaches exposed live parts within the limited approach boundary or the flash protection boundary.

4. A flash protection boundary must be established based on the engineering analysis and the approach boundaries listed in NFPA 70E-2004, Table 130.2 (C), "Approach Boundaries to Live Parts for Shock Protection."
5. The flash protection boundary for systems operating at 600 volts and below shall be four feet.
6. Personal protective equipment for workers performing work within a flash protection boundary shall be determined based upon a Flash Hazard Analysis, in accordance with Article 130.3 (A) of NFPA 70E-2004.
7. At least two qualified workers shall be assigned to any work inside of a limited approach boundary or flash protection boundary of exposed parts operating at more than 300 volts phase to phase or phase to ground.
8. Work performed on energized electrical circuits, or near exposed live parts shall be performed by qualified personnel using appropriate PPE. Unqualified personnel can only approach when the conductor/equipment is in a safe to work condition. If a need is identified for unqualified person(s) to cross the Limited Approach Boundary, a qualified person shall advise him or her of the possible hazards and continuously escort the unqualified person(s) while inside the Limited Approach Boundary. Under no circumstances shall the escorted unqualified person(s) be permitted to cross the Restricted Approach Boundary.
9. All electrical shocks shall be immediately reported. Affected personnel shall be evaluated at a Hanford occupational medical provider first aid station. Refer to [TFC-ESHQ-S CMLI-C-02](#).
10. Signs (designed in accordance with 29 CFR 1910.145), barricades, or attendants must be used to isolate the work area and warn others of the exposed energized electrical circuits. Electrical safety warning signs are worded as follows:

DANGER – ELECTRICAL HAZARDS -
AUTHORIZED PERSONNEL ONLY

11. Conductive accessories such as rings, watches, bracelets, metal frame glasses, metal hats, etc., shall not be worn where they present an electrical contact hazard with exposed energized conductors or circuit parts unless they are rendered non-conductive by covering, wrapping, or other insulation.

3.11 Resetting Tripped Protective Devices

NOTE: Electrical protective devices may be, but are not limited to, fuses, circuit breakers, or equipment protective devices (e.g., motor thermal units, government-furnished property, etc.).

1. After a circuit is de-energized by a protective device, the circuit must not be manually re-energized until it has been determined by a qualified person(s) that the equipment and circuit can be safely re-energized.

2. Electrical protective devices must be reset in the following sequence:
 - a. The cause of the trip is investigated by an electrician with proper troubleshooting techniques and test equipment to determine what condition occurred and that the equipment and circuit may be safely reenergized. The cause must be found, corrected, and understood to preclude repeat failures or unsafe conditions.
 - b. The electrical protective device is reset or replaced if the device is a fuse.

NOTE: All 120 VAC, single-pole GFCI receptacles that trip during use may be reset one time without completing the above sequence.

3.12 Performing Work Near or Affecting Electrical Utilities

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1. Electrical Utilities must be consulted as soon as practical when planning work that may affect their equipment or facilities.
2. It is not permitted to come closer than ten feet, including the length of conductive equipment, to overhead power lines with voltages up to 50 kilovolts (kV) phase-to-phase or phase-to-ground. Refer to NFPA 70E-2004, Article 130.2 (C) and Table 130.2 (C) for minimum approach distances.
3. If a vehicle is in transit with its structure lowered, the minimum clearance to overhead power lines up to 50 kV may be reduced to four feet. See DOE-RL-92-36, "Hanford Site Hoisting and Rigging Manual," for minimum clearance requirements of vehicles covered by DOE-RL-92-36.
4. Electrical Utilities must be notified at least 48 hours before performing any of the following operations or activities:
 - Moving any equipment taller than fourteen feet under overhead power lines
 - Operating equipment within twenty horizontal feet from overhead high-voltage (over 600 V) power lines.

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NOTE: The Hanford site electrical dispatcher is located at Building 251-W. The electrical dispatcher may be reached at 373-2321 or 373-7753 (see "Electrical Dispatcher" in the Hanford Yellow Pages). The Richland city electrical dispatcher may be reached at 942-4428 (after hours and weekends).

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NOTE: Requirements for operating cranes are described in DOE-RL-92-36, "Hanford Site Hoisting and Rigging Manual," 14.4.7, "Operating Cranes Near Energized Transmitters or Electrical Power Lines."

3.13 Drilling into Walls, Floors, or Outdoor Slabs and Excavations Containing Buried Electrical Cables

NOTE: [TFC-ESHQ-S-IS-C-03](#) describes the procedure for excavating, trenching, and shoring.

1. A documented plan shall be prepared for work requiring drilling, cutting or penetrating deeper into walls, floors, or other surfaces that may contain hidden electrical obstructions.
2. All pertinent drawings and documentation must be reviewed. Before the job is started, the job site must be reviewed to determine if obstructions are in the drilling or excavating path.
3. Electrical circuits or conductors in the drilling or excavating path must be de-energized to the maximum extent feasible before the job is started.
4. If it has been determined by the facility Operations manager that de-energizing will introduce additional risk or is not feasible, justification for not deenergizing the electrical circuits or conductors in the drilling or excavating path must be entered in the work plan/package and signed by the facility Operations manager prior to starting the job.
5. If the presence and location of electrical circuits or conductors cannot be accurately identified and de-energized, appropriate mitigating controls must be used. At a minimum, workers doing blind penetrations must use appropriate voltage-rated gloves with protective outer leather gloves and non-conductive safety glasses with side shields.
6. Suspected cable locations must be periodically verified with hand-held detection equipment or other acceptable means of locating utility installations.

3.14 Shift Routines, Inspections, and Surveillances

Managers and supervisors have the responsibility to ensure that shift routines, inspections, or surveillances that require working within the limited, restricted, or prohibited approach space (e.g., removing/opening electrical covers, working near exposed energized parts) are conducted by personnel qualified to work within those spaces.

4.0 DEFINITIONS

Authority Having Jurisdiction (AHJ). A person knowledgeable in the requirements of NFPA 70-2005, NFPA 70E-2004, 29 CFR 1910, Subpart S, and 29 CFR 1926, Subpart K, and assigned to interpret and enforce these electrical safety requirements on the Hanford Site.

Designated National Electrical Code inspector. A National Electrical Code (NEC) inspector designated by the CH2M HILL AHJ and who represents the NEC authority having jurisdiction.

Electrical Energized Work Permit. The standard method used to document a work plan used before performing energized electrical work as recommended by NFPA 70E-2004, Article 130.1 (A).

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Exposed parts (as applied to live parts). Capable of being inadvertently touched or approached nearer than a safe distance by a person. It is applied to parts not suitably guarded, isolated, or insulated.

Flash hazard analysis. A study investigating a worker's potential exposure to arc-flash energy, conducted for the purpose of injury prevention and the determination of safe work practices and the appropriate levels of PPE.

Flash protection boundary. An approach limit at a distance from exposed live parts within which a person could receive a second degree burn if an electrical arc flash were to occur.

Ground fault circuit interrupter. A device whose function is to interrupt the electric current to the load when a fault current to ground exceeds some pre-determined value that is less than that required to operate the overcurrent protective device of the supply circuit.

Limited approach boundary. An approach limit at a distance from an exposed live part within which a shock hazard exists.

Nationally Recognized Testing Laboratory. An organization which is recognized by OSHA in accordance with 29 CFR 1910.7 and which tests for safety, and lists, or labels, or accepts equipment or materials.

Prohibited approach boundary. An approach limit at a distance from an exposed live part within which work is considered the same as making contact with the live part.

Qualified person. One who has skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training on the hazards involved.

Restricted approach boundary. An approach limit at a distance from an exposed live part within which there is an increased risk of shock, due to electrical arc over combined with inadvertent movement, for personnel working in close proximity to the live part.

Troubleshooting and testing. Actions necessary to measure voltage and current and to verify the operability of equipment without repairing or replacing components.

Working near. Any activity inside the limited approach boundary of exposed energized electrical conductors or circuit parts that are not put into an electrically safe work condition.

Working on. Coming in contact with exposed energized electrical conductors or circuit parts with the hands, feet, or other body parts, with tools, probes, or with test equipment, regardless of the personal protective equipment a person is wearing.

5.0 SOURCES

5.1 Requirements

1. DOE O 440.1A, "Worker Protection Management for DOE Federal and Contractor Employees, Attachment 2, Contractor Requirements Document." (S/RID)
2. 10 CFR 851, "Worker Safety and Health Program."

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3. 29 CFR 1910, Subpart I, "Personal Protective Equipment." (S/RID)
 - a. 1910.137, "Electrical Protective Equipment."
4. 29 CFR 1910, Subpart S, "Electrical." (S/RID)
5. 29 CFR 1910.302, "Electric Utilization Systems."
6. 29 CFR 1910.303, "General Requirements (electrical)."
7. 29 CFR 1910.304, "Wiring Design and Protection."
8. 29 CFR 1910.305, "Wiring Methods, Components, and Equipment for General Use."
9. 29 CFR 1910.306, "Specific Purpose Equipment and Installations."
10. 29 CFR 1910.307, "Hazardous Locations."
11. 29 CFR 1910.308, "Special Systems."
12. 29 CFR 1910.331, "Scope."
13. 29 CFR 1910.332, "Training."
14. 29 CFR 1910.333, "Selection and Use of Work Practices."
15. 29 CFR 1910.334, "Use of Equipment."
16. 29 CFR 1910.335, "Safeguards for Personal Protection."
17. 29 CFR 1926, Subpart K, "Electrical." (S/RID)
18. NFPA 70-2005, "National Electrical Code (NEC)."
19. NFPA 70E-2004, "Standard for Electrical Safety Requirements for Employee Workplace."

5.2 References

1. DOE-HDBK-1092-98, DOE Handbook, "Electrical Safety."
2. TFC-ESHQ-S_CMLI-C-02, "Injury and Illness Events."
3. TFC-ESHQ-S_IS-C-03, "Excavating, Trenching, and Shoring."
4. TFC-ESHQ-S_SAF-C-02, "Job Hazard Analysis."
5. TFC-OPS-MAINT-C-02, "Pre-Job Briefing."
6. TFC-OPS-OPER-C-05, "Lockout/Tagout Program."
7. TFC-PRJ-P-C-02, "NEC Compliance Inspection."

ATTACHMENT A – ELECTRICAL HAZARDS AND CONTROLS

SAFETY HAZARDS	CONTROLS	ADDITIONAL TEXT
Minimum PPE requirements for work activities.	<ul style="list-style-type: none"> Eye/Face Protection, Safety glasses with side-shields (ANSI Z87.1) Footwear (ANSI Z41), Protective Footwear Clothing, shirt with sleeves and long pants or coveralls. 	See specific hazards for additional PPE requirements.
Operating breakers or starters (including push button starters) = or < 480 VAC, covers on.	<ul style="list-style-type: none"> PPE (Level 0)– Long sleeved shirt and pants made of untreated natural fiber and safety glasses with side shields Additional PPE: <ul style="list-style-type: none"> Leather work gloves, (which contain no metallic or conductive material). 	
Medium risk > 50 VAC and < 600 VAC Perform electrical activities such as installing electrical jumpers, terminating wires, pulling fuses, etc	<ul style="list-style-type: none"> Assigned workers electrical safety training is current Lockout/Tagout If it is determined by management that lockout/tagout creates increased or additional hazards, then an EEWP shall be approved for this work activity. 	Training Course 043870 “NFPA-70E Standards for Electrical Safety” or a Valid Washington State General Electrician Journeyman Certificate .
Medium risk > 50 VAC and < 600 VAC <ul style="list-style-type: none"> Positioning breakers with cover panels off (240V or less) Opening hinged covers to exposed bare, energized parts. 	<ul style="list-style-type: none"> Assigned workers electrical safety training is current. Use non-conductive protective equipment. Electrical equipment used to verify that circuits are de-energized will be tested for proper operation before use. Establish flash protection boundary of 4 feet Refer to the additional text to the right and determine the appropriate FR PPE. PPE (Level 0)– Long sleeved shirt and pants made of untreated natural fiber and safety glasses with side shields Additional PPE: <ul style="list-style-type: none"> Leather work gloves, (which contain no metallic or conductive material). 	The operating locations listed below have completed fault current hazard evaluations and may follow the controls listed to the left. - AN, AP, AW, AY, AZ, SY, A/AX, B, BX, BY, C, S, SX, T, TX, TY, U Tank Farms and 242-A Evaporator, 702-AZ To determine the PPE requirements for operating locations other than those listed above contact the project safety specialist. If the project safety specialist cannot be contacted, perform the work at Level 2 FR PPE.

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ATTACHMENT A – ELECTRICAL HAZARDS AND CONTROLS (cont.)

SAFETY HAZARDS	CONTROLS	ADDITIONAL TEXT
<p>Medium risk > 50 VAC and < 600 VAC</p> <ul style="list-style-type: none"> Work on energized electrical parts including voltage testing (240 VAC and below) Removal of circuit breakers or fused switches (240 VAC and below) CB or fused switch operation with cover panels off (>240V). Removal of bolted covers to exposed bare energized parts (240V or less). 	<ul style="list-style-type: none"> Assigned workers electrical safety training is current. Use non-conductive protective equipment. Electrical equipment used to verify that circuits are de-energized will be tested for proper operation before use. Establish a flash protection boundary of 4 feet To enter a restricted workspace a documented plan shall be developed and an EEWP may be required. PPE (Level 1) – FR Clothing, hardhat, safety glasses with side shields, and voltage rated gloves. <p>Note 1: If engineering fault current evaluation confirms <10k A short circuit available, the PPE requirement may be downgraded to Level 0 based on work scope and equipment condition as specified in Table 130.7(c)(9)(a) <i>Hazard Risk Category Classification</i>, in NFPA 70E.</p> <p>Note 2: Non-conductive head protection for PPE Level 1 may not be required if the task specific hazard analysis determines there is no danger of head injury from electric shock or burns due to contact with live parts.</p>	<p>The operating locations listed below have completed fault current hazard evaluations and may follow the controls listed to the left.</p> <ul style="list-style-type: none"> AN, AP, AW, AY, AZ, SY, A/AX, B, BX, BY, C, S, SX, T, TX, TY, U Tank Farms and 242-A Evaporator, 702-AZ Following locations confirmed <10kA B, BX, SX, T, TY Farms and 702-AZ <p>To determine the PPE requirements for operating locations other than those listed above contact the project safety specialist. If the project safety specialist cannot be contacted, perform the work at Level 2 FR PPE.</p>
<p>Medium risk > 50 VAC and < 600 VAC</p> <ul style="list-style-type: none"> Work on energized parts including voltage testing (>240 VAC) Removal of circuit breakers or fused switches (> 240 VAC) 	<ul style="list-style-type: none"> Assigned workers electrical safety training is current. Use non-conductive protective equipment. Electrical equipment used to verify that circuits are de-energized will be tested for proper operation before use. Establish a flash protection boundary of 4 feet. To enter a restricted workspace a documented work plan shall be developed and an EEWP may be required. PPE (Level 2) – FR Clothing, hardhat, arc rated face shield, safety glasses with side shields, hearing protection (foam ear plugs), and voltage rated gloves. **PPE DURING RESPIRATOR USE (Level 2): FR Clothing, Double layer switching hood, hearing protection (foam ear plugs), and voltage rated gloves. <p>Note 1: If engineering fault current evaluation confirms <10kA short circuit available, the PPE requirement may be downgraded to Level 1 based on work scope and equipment condition as specified in Table 130.7(c)(9)(a) <i>Hazard Risk Category Classification</i>, in NFPA 70E.</p> <p>Note 2: Arc flash calculations may also indicate distances which allow reduction of PPE to Level 1, Level 0, or less.</p>	<p>The operating locations listed below have completed fault current hazard evaluations and may follow the controls listed to the left.</p> <ul style="list-style-type: none"> AN, AP, AW, AY, AZ, SY, A/AX, B, BX, BY, C, S, SX, T, TX, TY, U Tank Farms and 242-A Evaporator, 702-AZ Following locations confirmed <10kA B, BX, SX, T, TY Farms and 702-AZ <p>To determine the PPE requirements for operating locations other than those listed above contact the project safety specialist. If the project safety specialist cannot be contacted, perform the work at Level 2 FR PPE.</p>

******Note: PPE recommended by Hanford Work Place Electrical Safety Board.

ATTACHMENT A – ELECTRICAL HAZARDS AND CONTROLS (cont.)

SAFETY HAZARDS	CONTROLS	ADDITIONAL TEXT
Working within the restricted space for exposed, energized electrical parts.	<ul style="list-style-type: none"> Assigned workers electrical safety training is current. To enter a restricted space, the qualified worker must have a documented plan. Establish a flash protection boundary of 4ft. All workers within the 4ft. area are required to wear the specified PPE PPE for electrical conductors 120V or less <ul style="list-style-type: none"> Level 0, Long sleeved shirt and pants made of untreated natural fiber and safety glasses with side shields PPE for electrical conductors > 120V but < or = 240V <ul style="list-style-type: none"> Level 1, FR Clothing, hardhat, safety glasses with side shields, and voltage rated gloves. PPE for electrical conductors >240V <ul style="list-style-type: none"> Level 2, FR Clothing, hardhat arc rated face shield, safety glasses with side shields, hearing protection (foam ear plugs), and voltage rated gloves. <p>Note 1: If engineering fault current evaluation confirms <10kA short circuit available, the PPE requirement may be downgraded to Level 1 based on work scope and equipment condition as specified in Table 130.7(c)(9)(a) <i>Hazard Risk Category Classification</i>, in NFPA 70E.</p> <p>Note 2: Arc flash calculations may also indicate distances which allow reduction of PPE to Level 1, Level 0, or less.</p> <ul style="list-style-type: none"> **PPE DURING RESPIRATOR USE >240V (Level 2): FR Clothing, Double layer switching hood, hearing protection (foam ear plugs), and voltage rated gloves. Use non-conductive protective equipment Do not wear conductive accessories unless rendered non-conductive by covering, wrapping, insulating. 	<p>043870 "High Risk Electrical Safety," or Washington State General Electrician Journeyman Certificate.</p> <p>To enter a restricted space an EEWP is required unless the exposed components are de-energized or shielded.</p> <p>For work performed in the following areas, PPE may be downgraded 1 level (e.g., if specified Level 1 ppe, then you may downgrade to Level 0 ppe): B, BX, SX, T, TY Farms and 702-AZ.</p> <p>Note: Heat stress potential exists for extended work periods. Contact IH professional for additional work controls.</p>
New installation/modification or temporary wiring	<ul style="list-style-type: none"> Perform continuity checks if installation is 240 VAC or greater. 	Examples: Rudy Cart and Mini Power centers

**Note: PPE recommended by Hanford Work Place Electrical Safety Board.